

Commonwealth of Kentucky
Division for Air Quality
PERMIT STATEMENT OF BASIS

Proposed
Title V, Operating
Permit: V-07-008
Air Products and Chemicals, Inc.
Catlettsburg, KY 41129
Date: August 28, 2007
Sukhendu K. Majumdar, Reviewer

SOURCE ID:	21-019-00117
SOURCE A.I. #:	83915
ACTIVITY ID:	APE20070001

SOURCE DESCRIPTION:

The hydrogen plant, which is owned and operated by Air Products and Chemicals, Inc., provides “over the fence” hydrogen and steam to the Catlettsburg Refinery. Construction and operation of the hydrogen plant was authorized by the Division for Air Quality in the permit VF-02-001, which was issued to Catlettsburg Refining, LLC. Since the hydrogen plant is owned and operated by Air Products and Chemicals, Inc., both the source and Catlettsburg Refining, LLC prefer that the hydrogen plant be issued a separate Title V permit.

The hydrogen plant, operated by Air Products, produces hydrogen using steam methane reforming technology to supply hydrogen and steam to the Marathon Petroleum Company’s Catlettsburg petroleum refinery. Natural gas is the methane source. Natural gas process feed and recycled hydrogen product are compressed, and then directed to the hydrogenation and desulfurization beds, where hydrogenation and desulfurization occur to remove sulfur from natural gas to prevent poisoning of the reformer catalyst. The desulfurization beds contain zinc oxide catalyst to adsorb any sulfur compound to form zinc sulfide. When the catalyst becomes spent, it is removed and disposed of. Steam is mixed with the desulfurized gas and the mix is directed to the reformer.

The reformer contains catalyst filled tubes in which reactions occur. The mixed feed is converted into hydrogen and a mixture of carbon oxides. The syngas effluent from the reformer tubes is cooled and enters the high temperature shift reactor where any CO in the gas is converted to CO₂ and additional hydrogen. The syngas out of the reactor is purified in the multi-vessel pressure swing adsorption unit where the impurities are adsorbed allowing high purity hydrogen to pass through. The hydrogen plant uses a flare to burn excess hydrogen product during the refinery hydrogen demand curtailment and also to burn PSA feed gas (syngas), PSA purge gas, hydrogen product, natural gas, and relief valve vents from the hydrogen plant during the startup, shutdowns, process upsets, malfunction, maintenance and emergencies.

Following are the five (5) emission points in the hydrogen plant.

Emission Point, EP-01: Reformer Flue Gas Stack

Emission Point, EP-02: Condensate Stripper Vent

Emission Point, EP-03: Flare

Emission Point, EP-04: Plant Wide Fugitive emissions

Emission Point, EP-05: Plant Wide intermittent and continuous steam vents

SINGLE SOURCE DETERMINATION:

The hydrogen plant, operated by Air Products, produces hydrogen using steam methane reforming technology to supply hydrogen and steam only to the Marathon Petroleum Company's Catlettsburg petroleum refinery. Marathon Petroleum Company's Catlettsburg refinery is a PSD major source for regulated pollutants. Air Products' hydrogen plant is within the property limit of Marathon's refinery. Together they are considered by the Kentucky Division for Air Quality to be a single "major source" as defined in 401 KAR 52:001, Section (1)(45)(b), definition of Major source for regulated air pollutants other than HAPS. Each owner/operator is responsible and liable for their own violations unless there is a joint cause for the violations.

EMISSION FACTORS AND SOURCE:

Emission Summary is provided in Table 1.

Emission Point, EP-01: Reformer Flue Gas Stack. Emissions were calculated using the as-built 455 million British thermal units per hour (mmBtu/hr) high heating value (HHV) maximum firing rate. Sulfur dioxide (SO₂), volatile organic compounds (VOC) and particulate matter less than 10 microns (PM₁₀) emissions were calculated using the emission factors contained in permit VF-02-001. Carbon monoxide (CO) and nitrogen oxide (NO_x) emissions were calculated based on worst case of 0.04 lb/mmBtu and 0.0596 lb/mmBtu respectively.

Emission Point, EP-02: Condensate Stripper Vent emissions were calculated based on the stack test performed as required by permit VF-02-001. CO emission was adjusted to account for the catalyst degradation.

For EP-03, 04, 05: used AP-42, engineering estimates.

Table 1. Emissions Summary

EP	Potential Emissions (ton/year)					
	SO ₂	NO _x	VOC	CO	PM/PM ₁₀	Methanol
01	1.2	118.78	10.96	79.7	15.15	
02			15.27	7.7		12.98
03	0	10.08	0.29	5.6	0	
04			1.71	6.5		
05			2.92			2.82
Total	1.2	*128.86	31.1	99.5	15.15	15.8

* Note: For compliance with synthetic minor limits, there is a source-wide limit of 112.7 tons per year of NO_x.

Applicable Regulations:

401 KAR 60:005, 40 CFR Part 60 Standards of Performance for New Stationary Sources-incorporates by reference 40 CFR 60.104(a)(1).

401 KAR 63:015- Flares.

Non-Applicable Regulations:

The source has elected to accept permit conditions to preclude the applicability of 401 KAR 51:017,

Prevention of Significant Deterioration of Air Quality, and 401 KAR 51:052, Review of New Sources In or Impacting Upon Non-attainment Areas.

401 KAR 59:015- New Indirect Heat Exchangers does not apply. The reformer is not an indirect heat exchanger because a heat transfer medium is not in used.

401 KAR 63:002, incorporating by reference 40 CFR 63 Subpart CC- National Emission Standards for Hazardous Air Pollutants from Petroleum Refineries.

401 KAR 63:002, incorporating by reference 40 CFR 63 Subpart H- National Emission Standards for Organic Hazardous Air Pollutants (HAPs) for Equipment Leaks.

401 KAR 60:005, incorporating by reference 40 CFR 60 Subpart VV- Standards of Performance for Equipment Leaks of VOC in the SOCMI, does not apply.

40 CFR 63 Subpart DDDDD or 40 CFR 63 Subpart A- National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters.

401 KAR 60:005, incorporating by reference 40 CFR Subpart Db- Standards of Performance for Industrial-Commercial-Institutional Steam Generating Unit.

401 KAR 60:005, incorporating by reference 40 CFR 60 Subpart GGG-Standards of Performance for Equipment Leaks of VOC in Petroleum Refineries, does not apply.

Compliance Assurance Monitoring (CAM) 40 CFR Part 64:

The Compliance Assurance Monitoring (CAM) rule applies to emission units on a pollutant-specific basis. The rule applies to emission units if an applicable emission limitation or standard applies, if an emission control device is used to achieve compliance, and if potential pre-control device emissions are greater than the major source threshold. A source-wide Title V permit has not been issued to Air Products and Chemicals. The initial Title V permit# V-05-089, for Marathon Petroleum Company at Catlettsburg Refining LLC, did not include the Hydrogen Plant. Therefore, the applicability of CAM will be evaluated at the next significant revision or renewal of the initial Title V permit for Air Products and Chemicals, Inc.

EMISSION AND OPERATING CAPS DESCRIPTION:

On March 29, 2002, Air Quality Permit VF-02-001 issued to Catlettsburg Refining, LLC, authorized the hydrogen plant construction and operation. Because the hydrogen plant is owned and operated by Air Products and Chemicals, Inc. both the company and Catlettsburg Refining, LLC asked for a separate Title V permit. The new permit for the hydrogen plant will retain the appropriate permit conditions and synthetic permit limitations imposed under permit VF-02-001.

PERIODIC MONITORING:

Nitrogen oxide (NO_x) shall be monitored by a NO_x continuous emission monitoring system (CEMS) that complies with all provisions of 40 CFR 60 Appendix B, Performance Specification 2.

Detector tube monitoring for hydrogen sulfide (H₂S) as described in alternative monitoring plan approved by December 30, 2003 letter from U.S. EPA Region IV shall be used. The approval letter was addressed to John Lyons, Director KY Division for Air Quality dated December 30, 2003 by Beverly H. Banister, Director Air, Pesticides and Toxics US EPA Region IV. The letter has been attached in Attachment A.

OPERATIONAL FLEXIBILITY:

N/A

CREDIBLE EVIDENCE:

This permit contains provisions which require that specific test methods, monitoring or recordkeeping be used as a demonstration of compliance with permit limits. On February 24, 1997, the U.S. EPA promulgated revisions to the following federal regulations: 40 CFR Part 51, Sec. 51.212; 40 CFR Part 52, Sec. 52.12; 40 CFR Part 52, Sec. 52.30; 40 CFR Part 60, Sec. 60.11 and 40 CFR Part 61, Sec. 61.12, that allow the use of credible evidence to establish compliance with applicable requirements. At the issuance of this permit, Kentucky has only adopted the provisions of 40 CFR Part 60, Sec. 60.11 and 40 CFR Part 61, Sec. 61.12 into its air quality regulations.

Attachment: A



alternativemonitoring
proposal.pdf